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ABSTRACT

Students in grades 6 to 8 are shown to display considerable variation in test anxiety, and results for this age group are comparable to previous studies with adult populations. Three factors rotated to an oblique solution accounted for 50 percent of the common score variance when a new 31-item version of the Mandler-Sarason Test Anxiety Scale was administered to students. The first two factors, "Worry" and "Emotionality", correspond to those obtained for adults. The third factor, labeled "Concentration", is supported by the attentional theory of test anxiety. Results indicate that the construct of test anxiety can be reliably measured for upper elementary and junior high school students. Tables illustrate the factor correlations with subscale and total test scores, norms and internal consistency estimates and intercorrelations of total test and factor subscales. (Author/CM)

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MEASUREMENT OF TEST ANXIETY FOR EXAMINEES, GRADES 6-8

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TM 820 472

Paper presented at the annual meeting of the American Educational Research Association held in New York, March 1982.

ABSTRACT

Factor structure of a new 31-item version of the Mandler-Sarason Test Anxiety Scale for students in grades 6-8 was determined. Results for the age group are comparable to those reported from previous studies with adult populations. Three factors rotated to an oblique solution accounted for 50% of the common score variance. The first two factors, "Worry" and "Emotionality", correspond closely to those obtained for adults in other studies. The third factor labeled 'Concentration" is supported by the attentional theory of test-anxiety. Results indicate that the construct of test anxiety can be reliably measured for students at upper elementary and junior high grade levels.

MEASUREMENT OF TEST ANXIETY FOR EXAMINEES, GRADES 6-8

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Test anxiety has been the object of numerous studies; however, most research has been restricted to examinees at the university level (Tryon, 1980; Hagvet, 1976). Fewer studies have involved measurement and treatment of test anxiety with younger populations. One reason for this may be the lack of well developed instruments for assessing test anxiety of younger examinees.

Factor analytic studies of test anxiety questionnaires for adults have recurrently pointed to two major distinguishable components of test anxiety (Liebert & Morris, 1967; Spiegler, Morris & Liebert, 1968; Sassenrath, 1964; Sassenrath, Kight, and Kaiser, 1965). The cognitive component, labeled "Worry", involves items dealing with concern about performance, the consequences of the performance, and doubts about one's ability. The second component, labeled "Emotionality", refers to physiological and affective reactions to the stress of the testing situation.

The Text Anxiety Scale for Children (TASC) was originally developed and used with children in grades 2 to 5 (Sarason, Davidson, Lighthall, and Waite, 1958). It consists of 43 "yes-no" items. Since 1958 TASC has repeatedly been factor analyzed with children from grades 2 to 7 (Dunn, 1964, 1965; Hagtvet, 1977; Rhine and Spaner, 1973; Silverstein and Mohan, 1964; Nicholls, 1976). Most factor analytic studies have found four factors for the TASC: a) Test Anxiety, b) Generalized School Anxiety, c) Recitation Anxiety, and d) Physiological Arousal in Anticipated Recitation Situations. Dunn (1964), Silverstein and Mohan (1964) concluded that the TASC should be considered more a measure of school anxiety rather than test anxiety.

A long unresolved question about test anxiety is whether younger students suffer from test anxiety as adults do, and whether this construct has the same underlying dimensions for these examinees. A measure such as the TASC cannot be used to study this question, because of its focus on school anxiety. It therefore seemed preferable to modify a well-known adult test anxiety scale and investigate its usefulness for younger examinees.

The objectives of the present study were to: (1) determine the factor structure of a modified version of the Mandler-Sarason Test Anxiety Scale (TAS) for students in grades 6-8; (2) compare results obtained for this age group to those which have been reported from previous studies with adult populations; (3) provide norms and internal consistency estimates of the total scale and its subscales for these examinees.

METHOD

Subjects

Participants in this study were 794 students from 36 classes of a metropolitan middle school (grades (6-8)). The sample was systematically divided into two subgroups; 550 students' responses (approximately 70%) were used for the factor analysis, and 244 students' responses (approximately 30%) were used as a crossvalidation sample to estimate reliabilities and establish norms.

Instrument

The instrument under study was a modified version of the 37-item Mandler-Sarason Test Anxiety Scale. Wording and syntax of 24 TAS items were adapted to the reading level and educational setting of students in grades 6-8. Typical changes involved replacing words such as "exams" with "tests". In addition, four new items were included, three items were retained as they

were, and nine items were deleted, making a 31-item scale. The true-false item format was maintained.

The Mandler-Sarason Test Anxiety Scale was chosen as model for the development of the present scale because of its ease of administration and extensive use with adult populations. Test-retest reliabilities of over .80 have been reported for the TAS (Sarason, 1978). Sarason (1972) gives permission to use the 37-item TAS for research purposes without requesting written permission of the author or publisher (p. 384).

Data Analysis

The 31-item modified Test Anxiety Scale was administered in March, 1981, two weeks prior to administration of county-wide standarized achievement tests. An intercorrelation item-matrix(using tetrachonic correlations) was factor analyzed. Principal axes, a common factor solution, with communalities in the diagonal of the correlation matrix was used. Commmalities were calculated through an iterative procedure using squared multiple correlations as first estimates and both orthogonal and oblique rotations were performed. Factor intercorrelations were .36 for I and II, .46 for I and III, and .15 for II and III. Due to the degree of correlation between factors, results of the oblique rotation are reported. The principal axes and the simple loadings oblique rotation procedures were performed using Guertin and Bailey (1970) library programs.

Item analysis and internal consistency (KR20) statistics and norms are based on the 244 students in the crossvalidation sample.

RESULTS

Three and four factors were rotated to an oblique solution. Inspection of eigen values and a scree test indicated a three or four factor solution

should be optimal. Factor loadings in both solutions were inspected for simple structure. A three factor model was chosen because it was more clearly interpretable. The three factor oblique solution accounted for 50% of common variance and 34% of total variance. These factors have been labeled "Worry", "Emotionality", and "Concentration".

Factor I, "Worry", is shown in Table 1. Items loading on this factor corresponded with the definition of the cognitive component of test anxiety. Fourteen items dealing with concern about performance and consequences of failure had loadings ranging from .81 to .38. Two items (11 and 26), dealing with physiological reactions loaded on both Factor I and II (.39 and .42 respectively). These items were keyed to the subscale based on Factor II.

Factor II, "Emotionality", consisted of eight items with loadings ranging from .73 to .38, and accounted for 14% of the common score variance, (See Table 2). Seven of these items deal with physiological and affective reactions to a testing situation. Item 2, with a loading of .43 refers to evaluation of one's ability relative to other students; this item is the only one that does not match the conceptual definition of emotionality.

Factor III, "Concentration", accounting for 9% of the common variance, is presented in Table 3. Items in this factor deal with difficulty in maintaining attention to task in a testing situation. Five items with loadings from .66 to .40 comprised this factor. Four of the original 31 items were not assigned to any subscale because of their relatively low loadings on the factors extracted.

A crossvalidation sample of 244 students was used for item analysis, internal consistency estimates and normative data statistics. Point biserial correlations between items and subscale scores and total scores are presented

in each factor table. (See Table 1, 2, and 3). Correlations for 26 items ranged from .30 to .72, with one exception. A correlation of .20 occurred between item 4 (while taking a test, I perspire a great deal) and total test score. Higher point biserial correlations were obtained with correlations of items to their respective subscales. Total test-item intercorrelations were very similar for the 31-item scale and for the 27-item scale.

Normative data and internal consistency (KR 20) estimates are presented in Table 4. Reliabilities ranged from .87 to .58. Both the 31-item scale and the 27-item scale have reliabilities of .87 suggesting that deletion of four items did not decrease the scale's internal consistency.

DISCUSSION

Results of the common factor analysis corresponded to previous factor analytic findings for other test anxiety questionnaires administered to adult populations. Both the "Worry" and "Emotionality" factors closely match factor components usually reported for adults; for this reason the same factor names were adopted. Although the third factor, "Concentration", has not appeared as a factor in previous factor analytic studies, it has been suggested in the "attentional theory of test anxiety" (Wine, 1971; Sarason, 1972).

According to the attentional theory of test anxiety, highly anxious students attend to self-relevant variables instead of to task-relevant variables. Both the worry and emotional components of test anxiety are seen as distractors of attention. Brooding thoughts about consequences of failure and physical symptons, shift attention from the task to the self. The concentration component found in this study, directly points to difficulty in maintaining attention on task. Correlations between the factors show that they are moderatedly inter-correlated (see Table 5). Worry and emotionality have the highest relationship

with 35% of common variance. Concentration is related to both worry and emotionality with a 25% and 21% of common variance respectively. These results are based on a sample with varying degrees of test anxiety. Previous research has found that interfering thought ("concentration") is more highly related to the worry component than to the emotionality component for highly test anxious students (Deffenbacher, 1966; Morris and Liebert, 1970).

Deffenbacher (1978), investigating the attentional theory of test anxiety, also found that worry and task-generated interference contribute more heavily to task interference than emotionality. For highly test anxious students worrisome thought seems to elicit more interference anxiety than physiological symptoms do. The Concentration Factor found in this scale might help extend research about the relationship of these component for high-test-anxious students.

This study offers evidence that younger students display considerable variation in test anxiety, as adults do, and that the construct may include similar underlying dimensions of worry, emotionality, and task concentrations. These results indicate that the present instrument, for measuring test anxiety of adolescents, may be factorially comparable to Test Anxiety Scale for adults. Further study of adolescent test anxiety using this instrument seems appropriate. Use of this instrument may enable researchers who study test anxiety of younger examinees to compare and interpret their findings in light of the considerable body of research in adult test anxiety with some assurance that comparable instruments have been used.

Several limitations to the findings described here should be noted:

(1) No investigation was conducted to ascertain that these factor structures are invariant over specific subpopulations (e.g., males and females, blacks and white, etc.).

(2) The factor analytic procedure was selected to identify the optimal factor structure for adolescents. No formal comparison of this factor pattern with that of an adult population has yet been attempted. Such a comparison would require different analytic procedures than those employed here.

(3) As yet, the relationship between test anxiety scores on the adolescent version of the TAS and actual test performance has not been evaluated. (This investigation is currently underway.)

(4) Because this study used a modified existing instrument, it is possible that there are other components of adolescent test anxiety which were not tapped by the items on this instrument.

Future investigations of all of these issues seems warranted.

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Table 1 Factor I: Worry Factor Loadings and Point Biserial Correlations with Subscale and Total Test Scores

Item	Abbreviated Statement	Loading	Point Biserial Correlations* Worry	Total T (27)	Total T (31)
1	I worry a lot before a big test.	.75	.72	.67	.65
3	If I had to take an intelligence test, I would worry	.51	.55	.49	.48
6	I feel very frightened when I have to take a surprise test.	.51	.61	.57	.56
7	During tests I find myself thinking what will happen if I fail.	.54	.51	.50	.49
12	After taking test I always feel I could have done better.	.59	.48	.46	.44
15	During a test I get so nervous I forget things I know.	.45	.64	.63	.62
17	When a test is over, I try to stop worrying, but I can't.	.59	.61	.59	.59
19	I wish tests did not bother me so much.	.64	.65	.61	.59
23	I really don't see why some people get so upset . . .	.48	.45	.37	.35
24	Even when I have studied, I feel very nervous.	.81	.71	.65	.64
27	I worry just before getting a test paper back.	.63	.50	.48	.48
28	I hate it when teachers give "pop" quizzes.	.45	.38	.31	.31
29	When I don't know answers, I worry about what teacher . . .	.38	.51	.51	.52
30	When I do badly on tests, I worry about what parents . . .	.72	.46	.43	.40

* all are significant $\rho \leq .001$

Table 2. Factor II: Emotionality Factor Loadings and Point Biserial Correlations with Subscale and Total Test Scores

Item	Abbreviated Statement	Loading	Point Biserial Correlations* Emotionality	Total T (27)	Total T (31)
2	During a test I keep thinking other students are smarter.	.43	.58	.50	.52
4	While taking a test I perspire a great deal.	.39	.35	.20	.20
8	After important tests my stomach gets upset.	.60	.54	.42	.41
11	I feel my heart beating very fast during a test.	.45	.59	.48	.46
13	I usually feel sad after taking a test.	.73	.52	.41	.42
14	When taking a test my feelings bother me.	.38	.54	.44	.43
25	I don't enjoy eating before an important test.	.49	.46	.30	.31
26.	Before an important examination I find hands or arms shaking.	.43	.58	.53	.53

* all are significant $p \leq .001$

Table 3. Factor III: Concentration Factor Loadings and Point Biserial Correlations with Subscale and Total Test Scores

Item	Abbreviated Statement	Loading	Point Biserial Correlations* Concentration	Total T (27)	Total T (31)
5	During tests I find myself thinking about other things.	.61	.62	.32	.34
9	I freeze up on things like math tests.	.40	.58	.42	.42
16	The harder I work on a test the more confused I get.	.45	.64	.43	.43
21	Thinking about my grades makes it harder for me to study.	.40	.62	.53	.53
31	Sometimes on a test I just can't think.	.66	.59	.44	.43

* all are significant $\rho \leq .001$

Table 4. Total Tests' and Subscales' Norms and Internal Consistency Estimates

	Total Test	Total Test	Worry	Emotionality	Concentration
Number of Items	31	27	14	8	5
Mean	15.86	14.17	8.98	2.79	2.42
Standard Deviation	6.59	6.04	3.70	1.94	1.51
Q_4 (Max)	28	25	14	8	6
Q_3 (75th percentile rank)	21	19	12	4	4
Q_2 (50th percentile rank)	16.5	15	10	3	2
Q_1 (25th percentile rank)	11	10	6	1	1
Mode	16	13	13	1	3
KR_{20}	.87	.87	.83	.62	.58
Standard Error of Measur.	2.38	2.13	1.53	1.23	.93

Table 5. Total Test and Factor Subscales Intercorrelations

	Total Test (27 items)	Worry	Emotionality	Concentration
Total test	1.00	.93	.80	.71
Worry		1.00	.59	.50
Emotionality			1.00	.46
Concentration				1.00